RESEARCH DEPARTMENT

'MINAR'

A miniature rack modular system for electronic equipment

REPORT No. A-078
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THE BRITISH BROADCASTING CORPORATION
ENGINEERING DIVISION

RESEARCH DEPARTMENT

'MINAR' - A MINIATURE RACK MODULAR SYSTEM FOR ELECTRONIC EQUIPMENT

Report No. A-078

(1963/46)

T.N.J. Archard
M.A. Hammond

(R.J. Mears)

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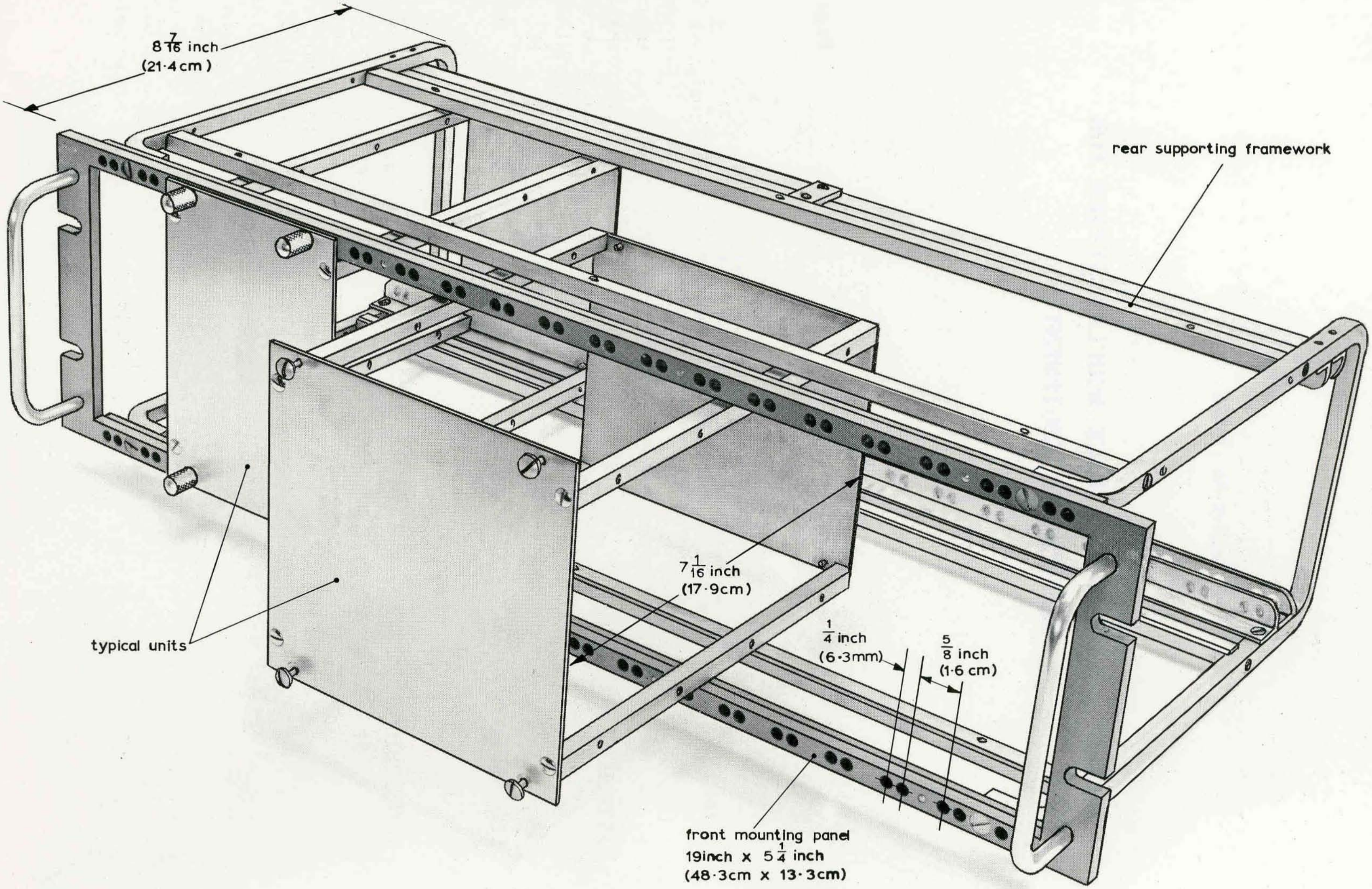

Fig. 1 - Basic framework with two typical units

October 1963

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'MINAR' - A MINIATURE RACK MODULAR SYSTEM FOR ELECTRONIC EQUIPMENT

SUMMARY

'MINAR' is a modular system of unit construction based on a standard 19-inch × $5\frac{1}{4}$-inch (48·3 cm × 13·3 cm) panel. This panel is in the form of a miniature rack into which units of various sizes may be inserted. The mechanical construction is straightforward and the overall assembly of units is capable of being used either in a standard 19-inch (48·3 cm) bay or in a portable carrying case. The design is particularly suitable for laboratory and prototype equipment.

1. INTRODUCTION

One of the standard units for the construction of broadcasting equipment is the 19-inch (48·3 cm) rack with its series of panels of different heights. With the advent of transistors the 19-inch (48·3 cm) panel unit tends to become unduly large: even the smallest panel size 19-inch × $1\frac{3}{4}$-inch (48·3 cm × 4·4 cm) is unnecessarily cumbersome as a single unit. It was to overcome these disadvantages while at the same time retaining the use of the basic 19-inch (48·3 cm) rack, that the 'MINAR' system* was introduced.

2. DESCRIPTION

Fig. 1 shows a skeleton 'MINAR' unit. This consists of a front mounting panel and rear supporting framework into which may be plugged a variety of units. The front mounting panel conforms in height, width and end fixings to a standard 19-inch × $5\frac{1}{4}$-inch (48·3 cm × 13·3 cm) panel. The holes along top and bottom edges are of similar pattern to the vertical fixings on a normal 19-inch (48·3 cm) rack except that the spacings between the holes are half those of the normal rack, i.e. $\frac{5}{8}$ inch (1·6 cm) and $\frac{1}{4}$ inch (6·5 mm) instead of $1\frac{1}{4}$ inch (3·2 cm) and $\frac{1}{2}$ inch (1·3 cm). The holes are counterbored and tapped 4BA. The tapped portion is contained in a demountable strip, so that the thread size may be easily changed (to say UNF) or defective threads may be replaced. The units which fit into the front panel and framework are each $5\frac{1}{8}$ inches (13 cm) high but their width is variable and may be built up in $\frac{7}{8}$ inch (2·22 cm) increments to a maximum of $17\frac{1}{2}$ inches (44·4 cm). These units may be fitted in any order and because of the system of hole spacings employed their fixings will always be in alignment with the holes in the mounting panel and framework.

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*British Patent No. 941,503.

The plug-in units consist of a front and rear panel separated by tie rods, as shown in Fig. 2. These tie rods are all standard $\frac{5}{16}$ inch (8 mm) square Dural (or similar) material, uniformly drilled and tapped to accept printed circuits, Veroboards or conventional chassis. The vertical dimensions between the rods are so arranged that when Veroboards are used, automatic earthing of the board takes place, as the copper clad strip and tie rods are in alignment.

It will be appreciated that from time to time it is necessary to employ screening covers on these plug-in units. These covers would normally increase the overall lateral dimensions of the unit by the thickness of the screen and so prevent fitting within the dimensions of the rack. To overcome this difficulty but at the same time maintain an accurate fit within the rack, the tie rods have their end fixings located eccentrically; rotation of the rods on their fixings will either increase or decrease the lateral dimensions over the tolerances required. This feature is shown in Fig. 3. The chassis or circuit-board fixing screws are however drilled on the same centre line as the end screws and therefore maintain their position relative to each other when the rods are rotated. By removing the top tie-rod end screws and slightly slackening off those on the lower tie rod, the chassis or circuit-boards swivel outwards to facilitate wiring and servicing as shown in Fig. 4.

In development work it is often necessary to remove and replace units at frequent intervals. To avoid the necessity of screwing and unscrewing the panel fixing screws, spring clips may be fitted as shown in Fig. 5. The clips are strong enough to hold the unit in position but sufficiently resilient to allow it to be rapidly withdrawn.

The whole miniature rack assembly may be mounted either in a standard 19-inch (48·3 cm) rack, as in Fig. 6, or in the special carrying case shown in Fig. 7. The carrying case has a number of special features. The rubber feet may be fitted with telescopic legs so that the unit can be conveniently operated on a desk in the manner shown in Fig. 8. The method of adjusting the legs is shown in Fig. 9. Turning the leg through 90° expands the spring (b) and allows the leg to be withdrawn to any pre-determined position. Four such positions are determined by notches. Locking into these positions is accomplished by again turning the leg through 90°. The box itself is provided with a reinforcing rib running along the inside of its top and bottom sides. The inside of the lid of the case forms a convenient place in which to fix circuit diagrams and also provides storage for mains and signal leads. The carrying cases themselves may be stacked to form a portable bay as shown in Fig. 10 (the rubber feet of the upper case locating in dimples in the top of the lower case). In this instance the cases are shown fitted with louvres and end cut-outs.

Provision has also been made for separate carrying covers for the individual plug-in units, so that they may be used independently. Such an arrangement is shown in Fig. 11.

Typical 'MINAR' installations are shown in Figs. 12, 13(a), 13(b), and 14 with a summary of standard parts and fitments in Fig. 15.

3. CONCLUSIONS

In laboratory service the 'MINAR' system has been found to have the desired flexibility and to offer the following advantages:-

(a) Interchangeability of units in miniature rack.

(b) Interchangeability of miniature rack assembly in standard 19-inch (48·3 cm) bay or rack or portable carrying case.

(c) The carrying cases themselves may be stacked to form a portable bay.

(d) Excluding the mounting panel and carrying cases, only two basic sizes of materials are used, i.e. $\frac{1}{16}$-inch (1·6 mm) sheet for panels and $\frac{5}{16}$-inch (8 mm) square rod for tie rods and framework.

(e) Simplicity of construction, no elaborate machining or forming necessary.

(f) Individual units may be used independently in their own carrying-covers.

(g) Units may be screened or unscreened and still maintain an accurate fit in the framework without the use of supplementary packing or the alteration of fixing centres.

(h) Chassis panels swivel outwards for ease of servicing and assembly.

(i) Units may be fitted with spring locator clips so that they may be rapidly inserted or withdrawn without the necessity of screwing and unscrewing the panel fixing screws.

(j) Telescopic feet in carrying case allows for ease of operation when unit is on a bench or table.

(k) All piece parts screw together and occupy minimum storage space. No highly skilled labour is necessary for their assembly.

(l) The particular hole centres and panel sizes chosen for the units in the miniature rack are half those used in the standard 19-inch (48·3 cm) racks or bays. Engineers are very familiar with the latter sizes, and to memorize the miniature rack sizes it is only necessary to divide the 19-inch (48·3 cm) standard panel sizes by 2.

(m) A wide variety of plugs and sockets may be used with this construction. Use is not restricted to one manufacturer's product.

(n) The use of the removable tapped strips enables the size of holes to be changed or any stripped threads to be replaced without the entire mounting panel becoming obsolete or useless.

(o) Standard panel blanks of various sizes, tie rods, frameworks and other parts can be manufactured in quantity in advance, and kept in stock until required. Considerable machine-shop time is thus saved.

(q) Draughtsmen's and engineers' time is saved by the use of standard pre-printed drawings for front and rear panels, side-screens etc., to which only the drilling details for a particular design need to be added.

(r) It has been found in practice that the use of this system in the Research Department has enabled what would have been 'breadboard' constructed units to be directly engineered in such a manner as to be immediately suitable for experimental use both inside the Department and in the field.

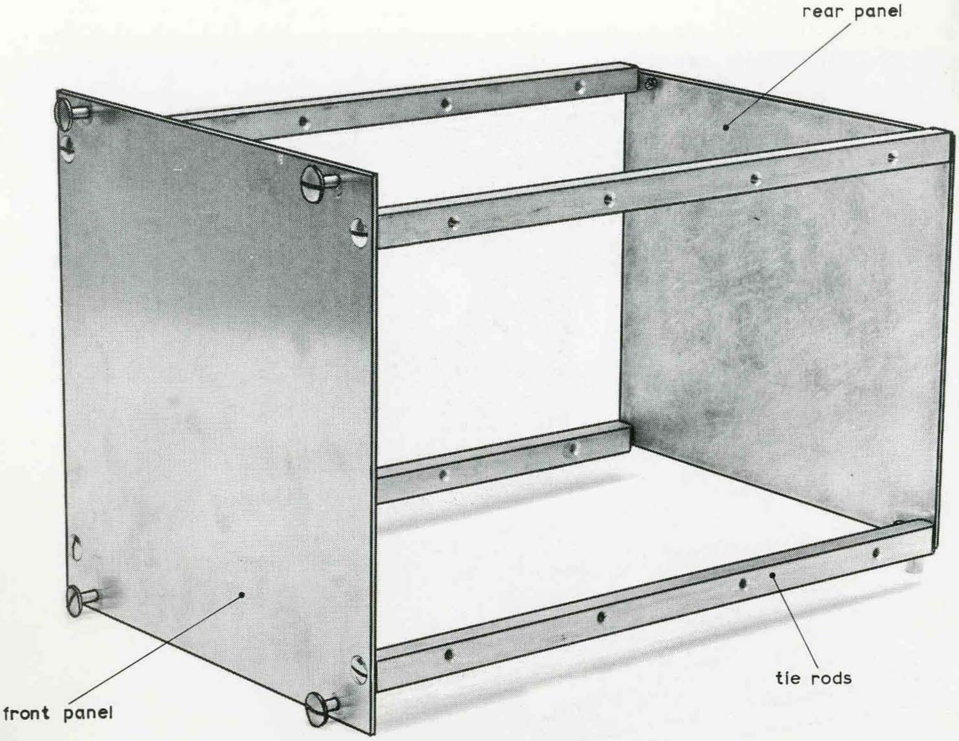


Fig. 2 - Typical plug-in unit

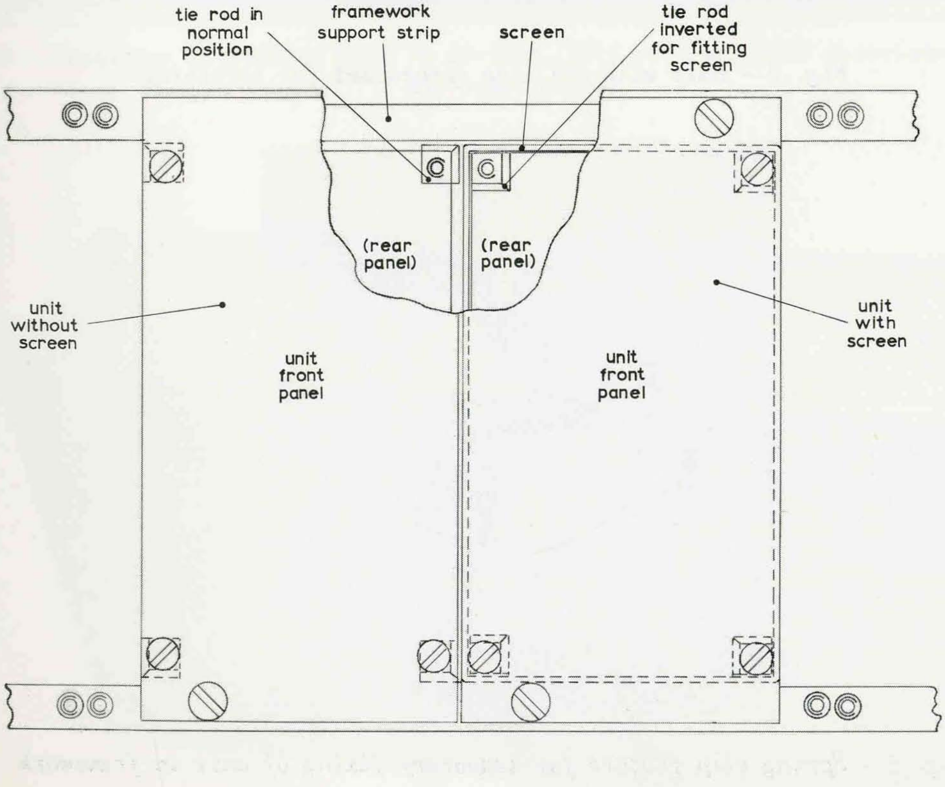


Fig. 3 - Turnover feature on rods to allow screen to be fitted

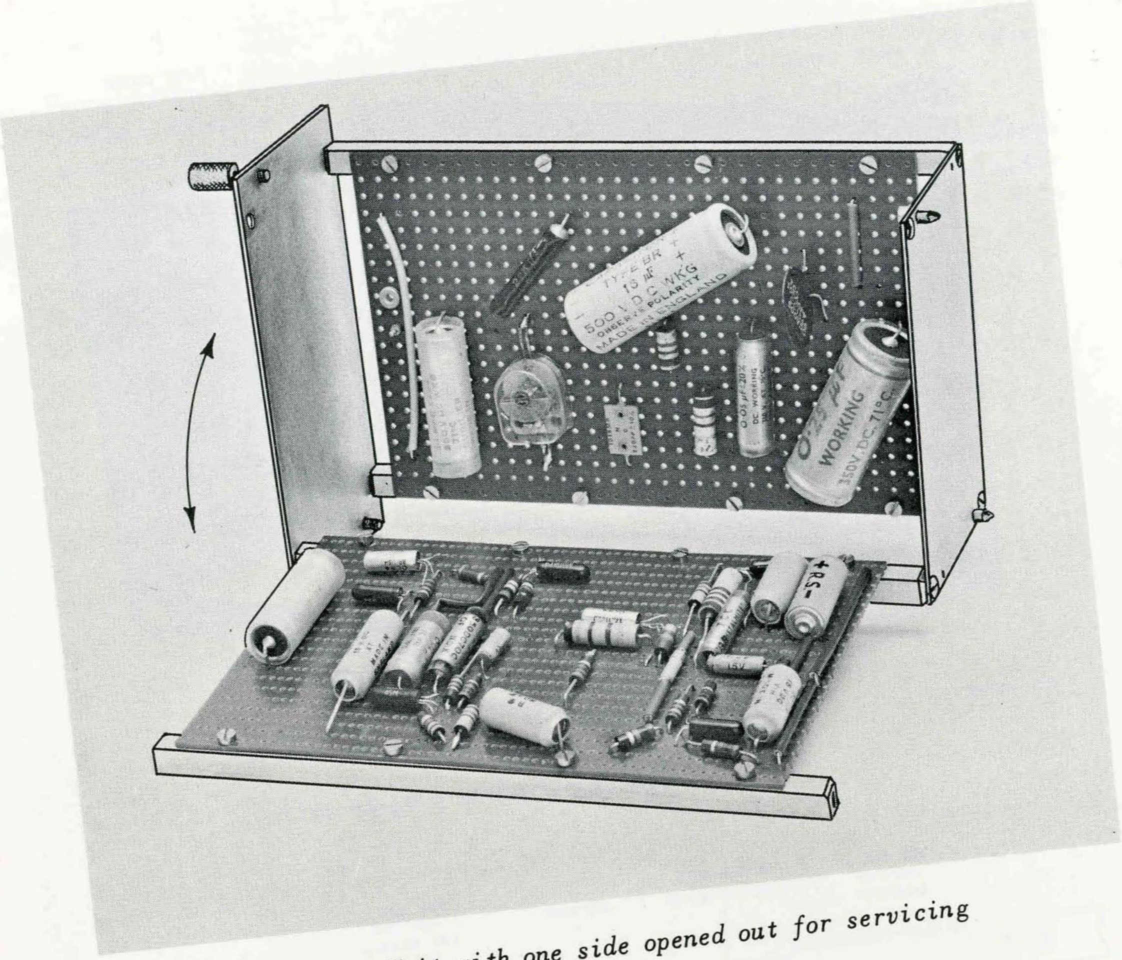


Fig. 4 - Unit with one side opened out for servicing

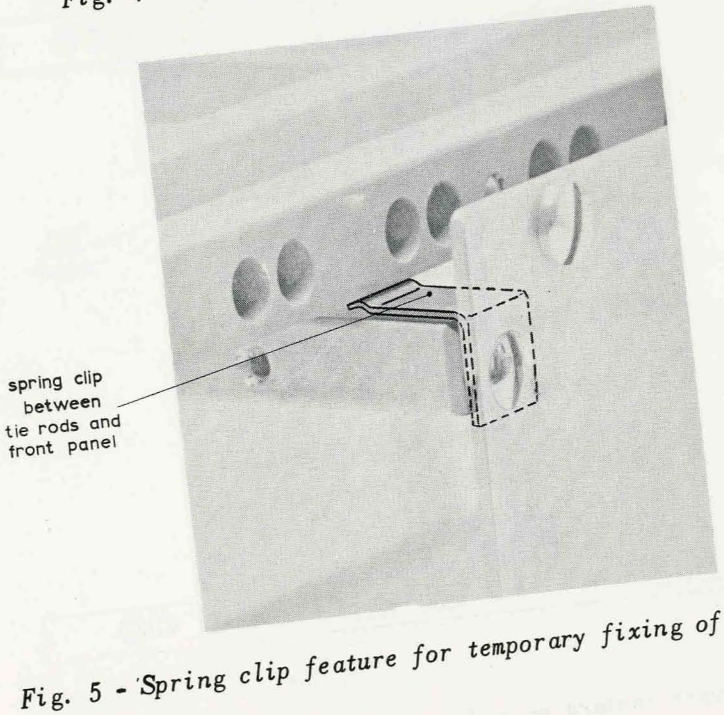


Fig. 5 - Spring clip feature for temporary fixing of unit in framework

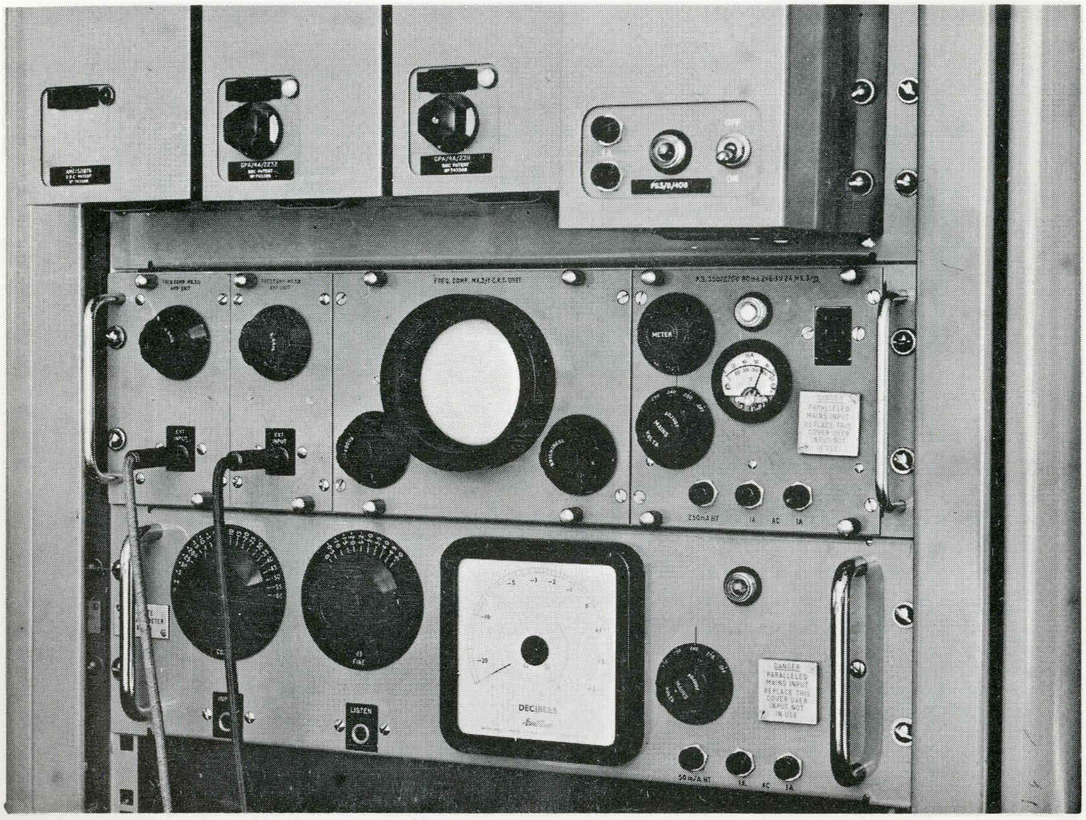


Fig. 6 - Frequency Comparator Unit in 19-inch (48·3 cm) rack with associated amplifiers and power supply

Fig. 7 - Carrying Case

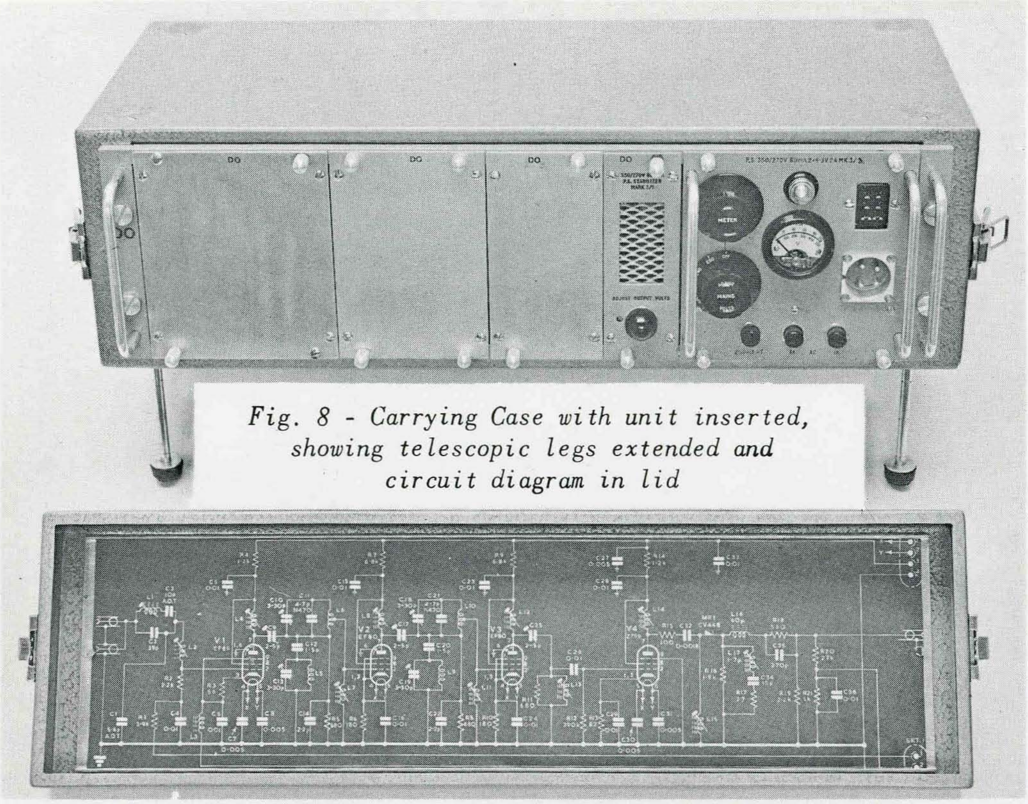
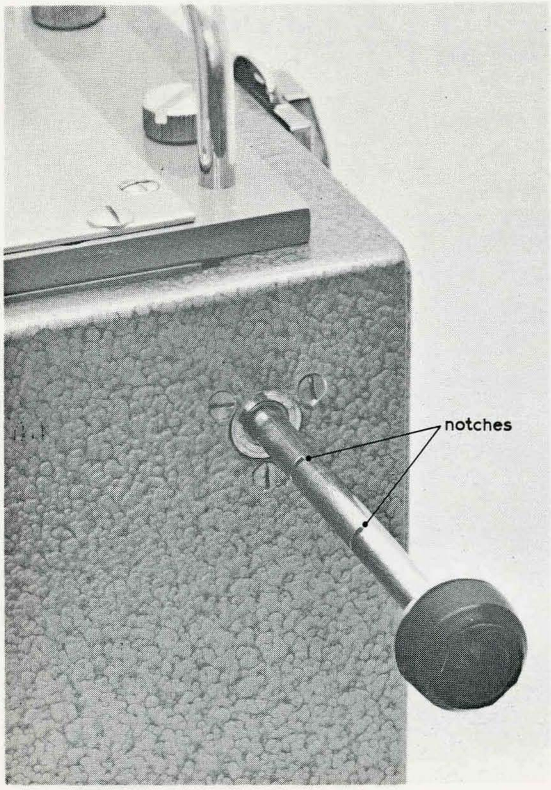


Fig. 8 - Carrying Case with unit inserted, showing telescopic legs extended and circuit diagram in lid



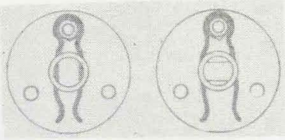


Fig. 9
Method of adjusting telescopic legs

(a) Spring closed leg locked

(b) Spring expanded leg free

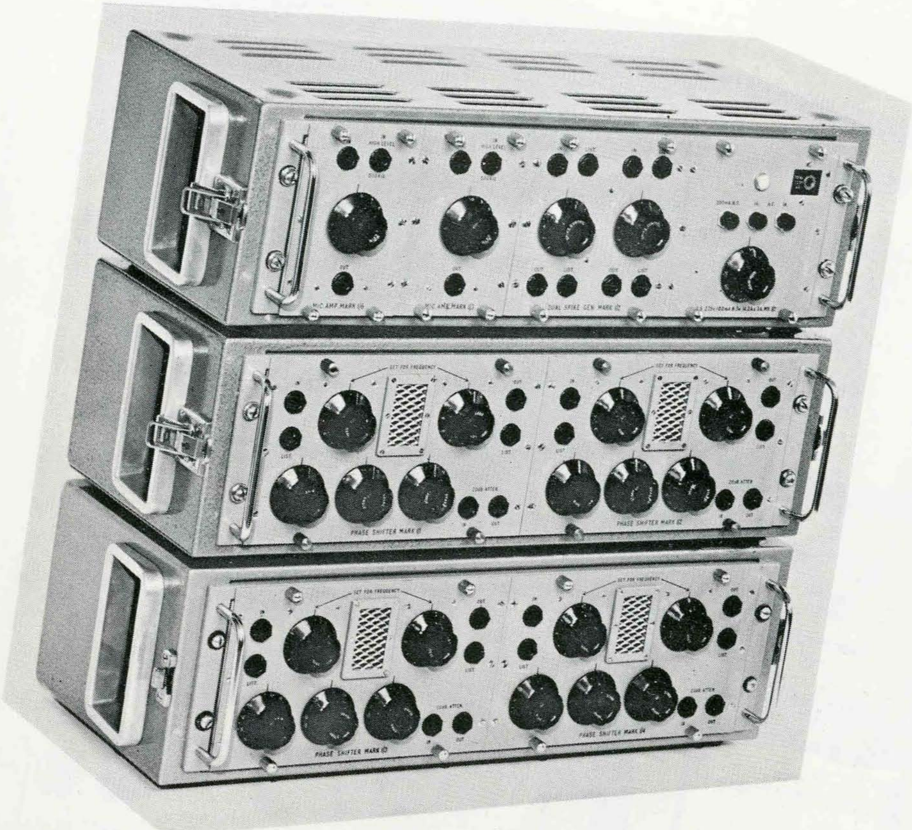


Fig. 10
Stacked arrangement of 'MINAR' units in portable cases

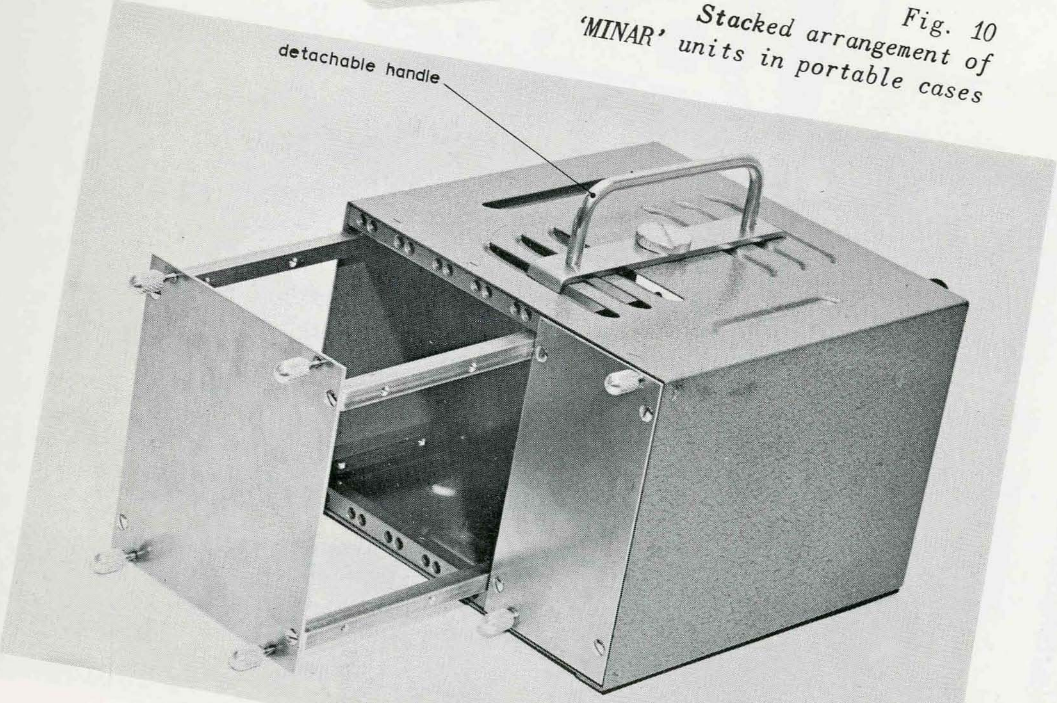


Fig. 11 - Typical units in separate carrying-cover

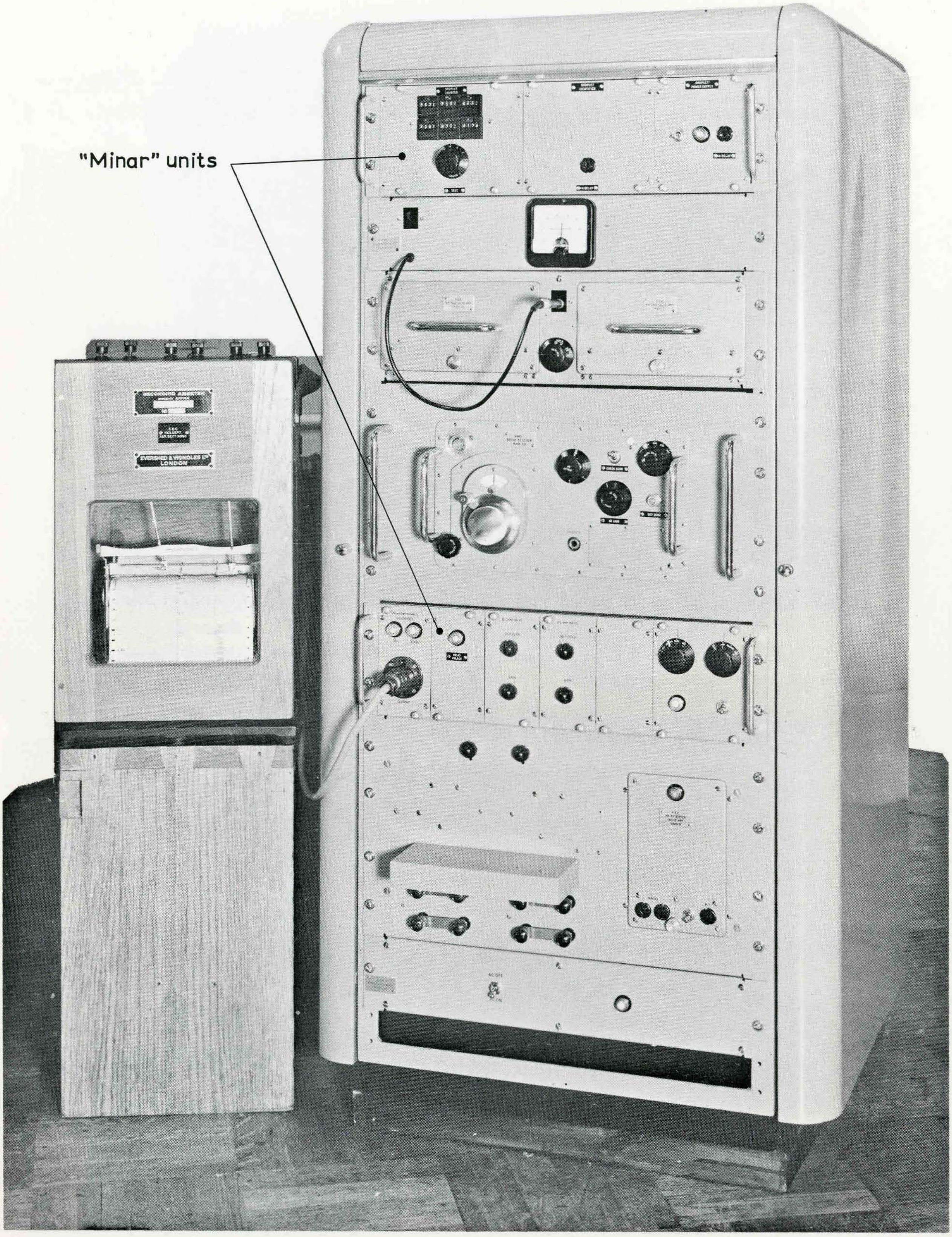


Fig. 12 - Corona Current Measuring Equipment using 'MINAR' units mounted in a 19-inch (48·3 cm) rack

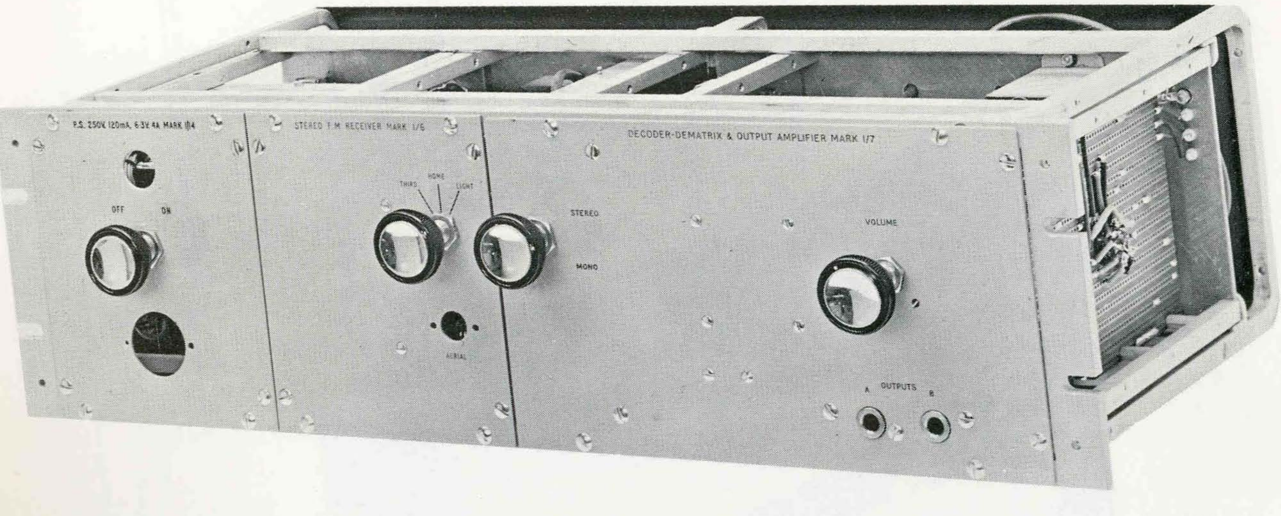

P.S. 250V 120mA, 6·3V 4A MARK I/4
OFF
ON
STEREO F.M. RECEIVER MARK 1/6
THIRD
HOME
LIGHT
AERIAL
DECODER-DEMATRIX & OUTPUT AMPLIFIER MARK 1/7
STEREO
MONO
VOLUME
OUTPUTS
A
B

Fig. 13(a) - Experimental f.m. Receiver Unit suitable for rack mounting

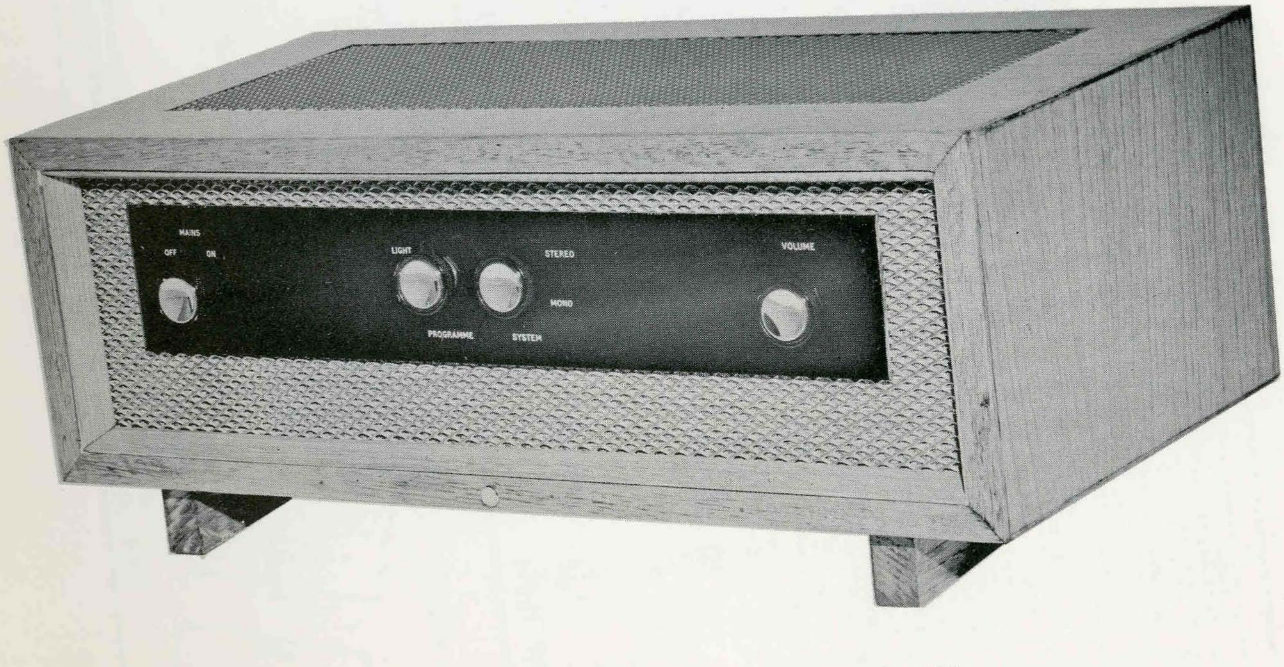


Fig. 13(b) - The same unit mounted in cabinet for domestic use

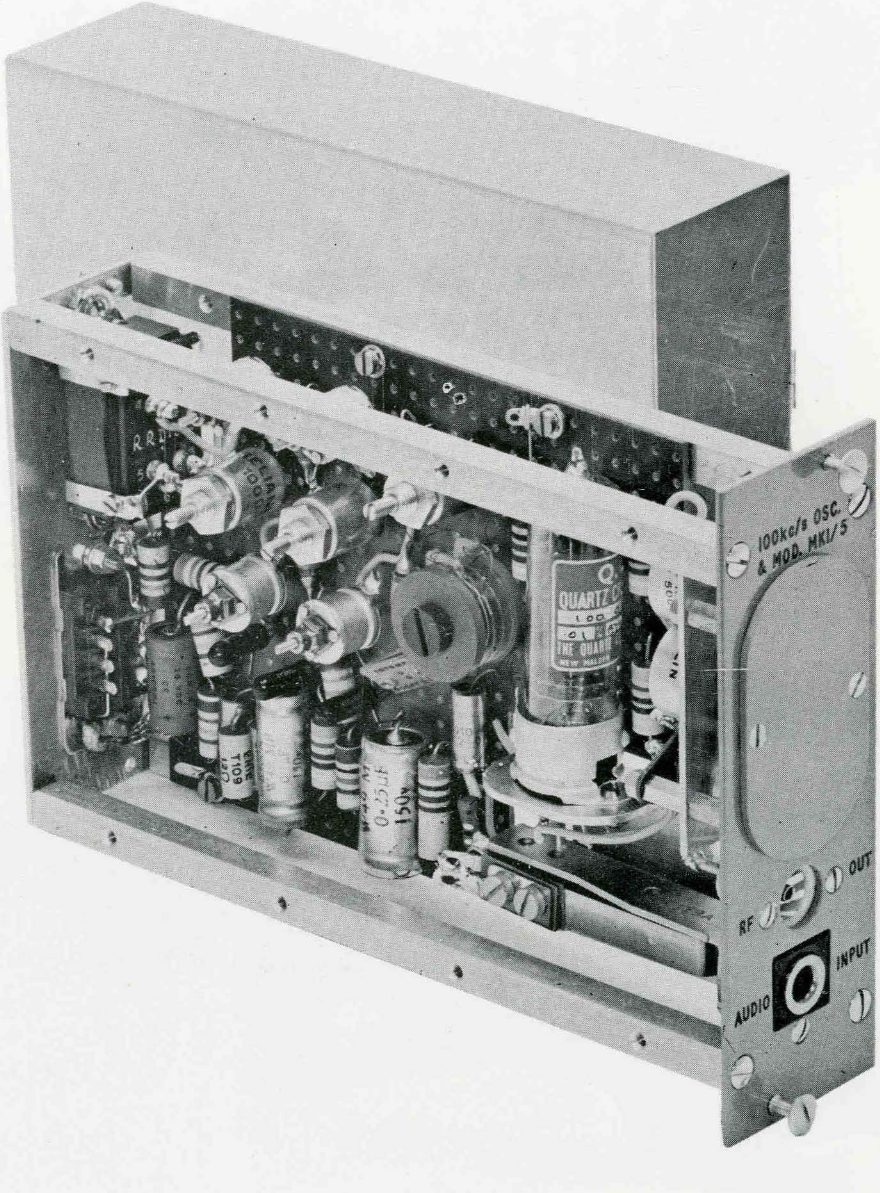
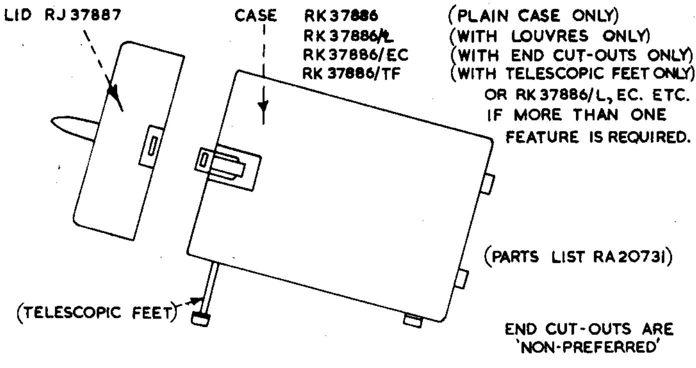
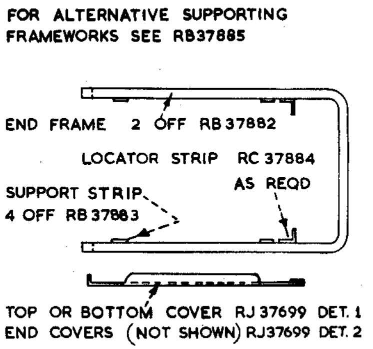
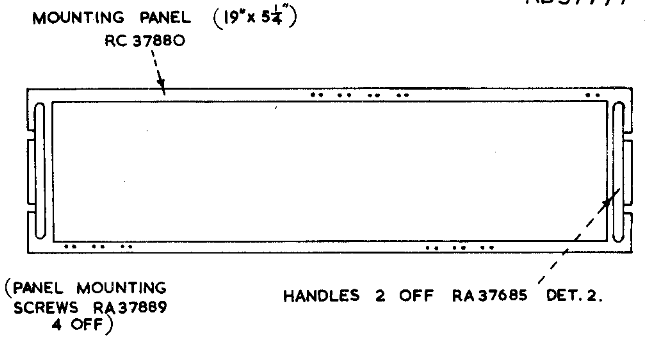


Fig. 14 - Unit for Fading Simulator

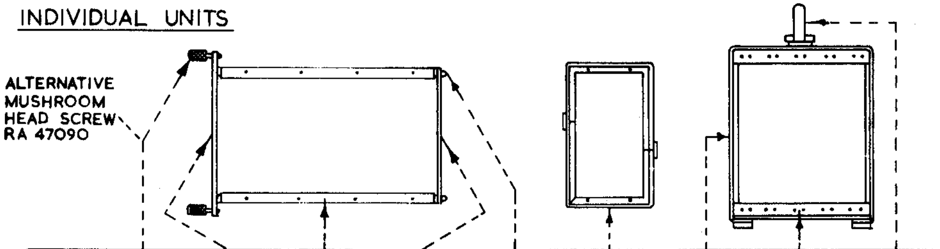
RB37777


LID RJ 37887
CASE RK 37886 (PLAIN CASE ONLY)
RK 37886/L (WITH LOUVRES ONLY)
RK 37886/EC (WITH END CUT-OUTS ONLY)
RK 37886/TF (WITH TELESCOPIC FEET ONLY)
OR RK 37886/L, EC. ETC. IF MORE THAN ONE FEATURE IS REQUIRED.
(TELESCOPIC FEET)
(PARTS LIST RA20731)
END CUT-OUTS ARE 'NON-PREFERRED'


FOR ALTERNATIVE SUPPORTING FRAMEWORKS SEE RB37885
END FRAME 2 OFF RB 37882
LOCATOR STRIP RC 37884 AS REQD
SUPPORT STRIP 4 OFF RB 37883
TOP OR BOTTOM COVER RJ 37699 DET. 1
END COVERS (NOT SHOWN) RJ37699 DET. 2


MOUNTING PANEL (19"x 5¼")
RC 37880
(PANEL MOUNTING SCREWS RA37889 4 OFF)
HANDLES 2 OFF RA 37685 DET. 2.

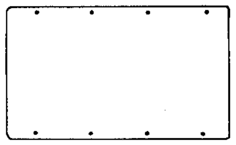
INDIVIDUAL UNITS



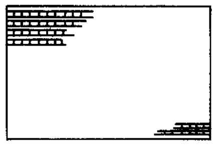
UNIT NOM. SIZE	CAPTIVE SCREWS	FRONT PANEL BLANK	TIE RODS	REAR PANEL BLANK	LOCATOR PINS	OVERALL SCREEN	UNIT COVER	MOUNTING STRIPS	HANDLE ASSEMBLY
$\frac{7}{8}$"	RA37888 2 OFF	RB37754 DET. 1	RA 37734 2 OFF	RB 37737 DET. 1	RA 37710 2 OFF	RC 37738 DET. 1	—	—	—
$1\frac{3}{4}$"	RA 37888 2 OFF	RB 37754 DET. 2	RA 37734 4 OFF	RB 37737 DET. 2	RA 37710 2 OFF	RC 37738 DET. 2	RG37681	RB37683 DET. 1	—
$2\frac{5}{8}$"	RA 37888 2 OFF	RB 37754 DET. 3	RA 37734 4 OFF	RB 37737 DET. 3	RA 37710 2 OFF	RC37738 DET. 3	RH 37719	RB37723 DET. 1	—
$3\frac{1}{2}$"	RA37888 4 OFF	RB 37754 DET 4	RA 37734 4 OFF	RB 37737 DET 4	RA 37710 2 OFF	RC 37738 DET 4	RH 37694	RB 37683 DET 4	RB 37684
$4\frac{3}{8}$"	RA 37888 4 OFF	RB 37754 DET 5	RA 37734 4 OFF	RB 37737 DET 5	RA 37710 2 OFF	RC 37738 DET. 5	RH 37721	RB 37723 DET. 2	RB37684
$5\frac{1}{4}$"	RA 37888 4 OFF	RB 37754 DET 6	RA37734 4 OFF	RB 37737 DET 6	RA37710 2 OFF	RC 37738 DET 6	RH 37676	RB 37683 DET 2	RB 37684
$6\frac{1}{8}$"	RA 37888 4 OFF	RB 37754 DET 7	RA 37734 4 OFF	RB 37737 DET 7	RA37710 2 OFF	RC 37738 DET 7	RJ 37722	RB37723 DET 3	RB 37684
7"	RA37888 4 OFF	RB 37754 DET 8	RA 37734 4 OFF	RB 37737 DET 8	RA 37710 2 OFF	RC 37738 DET 8	RJ 37682	RB37683 DET 3	RB 37684

QUANTITIES SHOWN ARE 'PER UNIT'

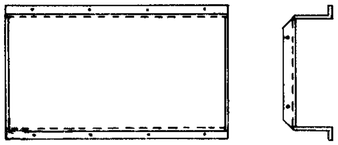
STANDARD UNIT FITMENTS



SIDE SCREEN RA37712



'VEROBOARD' ($4\frac{1}{4}$" x 6·4") RB37693



CHASSIS (VERTICAL MTG) RB 37739

NOTES

MOUNTING PANEL RC37880 WILL ACCEPT UNIT MULTIPLES TO A MAXIMUM OF $17\frac{1}{2}$"

FOR INDIVIDUAL UNITS OF NOMINAL SIZE $7\frac{7}{8}$" AND OVER, REFER TO THE FOLLOWING DRAWINGS:-

RB 37755 (FRONT PANEL BLANKS)
RB 37756 (REAR PANEL BLANKS)

FOR 'PLUG-IN' UNIT APPLICATION, SEE RB37800.

FOR 'PLUG-IN VEROBOARD' APPLICATION SEE RB 37892

DUMMY FRONT PANELS - RB37875.

OPTIONAL SPRING & FRONT PANEL LOCATOR APPLICATION-RA37894

Fig. 15 - A summary of standard parts and fitments

Printed by B.B.C. Research Department, Kingswood Warren, Tadworth, Surrey